

IN  
MUTUAL  
TOLERANCE



by Ron LeValley

Only twenty-six nautical miles west of San Francisco's Golden Gate Bridge, near the edge of the continental shelf, lies a cluster of granite rocks known as the Farallon Islands. They are home to the greatest sea bird colony in the contiguous United States.

Southeast Farallon, the largest and most accessible island in the group, has been described as "loneliness covered with guano." But for the half dozen biologists and volunteers that comprise the entire human population on less than a hundred acres, the presence of nearly 250,000 sea birds and 2,000 seals and sea lions make it much too exciting to ever be lonely.

Since 1968 the Point Reyes Bird Observatory (PRBO) has manned a research station on Southeast Farallon Island and since 1971, under the direction of Dr. David Ainley, the breeding sea birds of the islands have been studied intensively. My own involvement began in 1968 when I visited the island for a month as a PRBO volunteer. That visit and the numerous ones that followed, increased my interest in sea bird biology and the ocean until, in 1976, I joined the Observatory's staff as a Farallon biologist. In the ten years of our residency on the Farallones, while playing a positive role in ensuring the well-being of the island's wildlife, we have learned a great deal about the biology of sea birds and their relationship with the ocean.

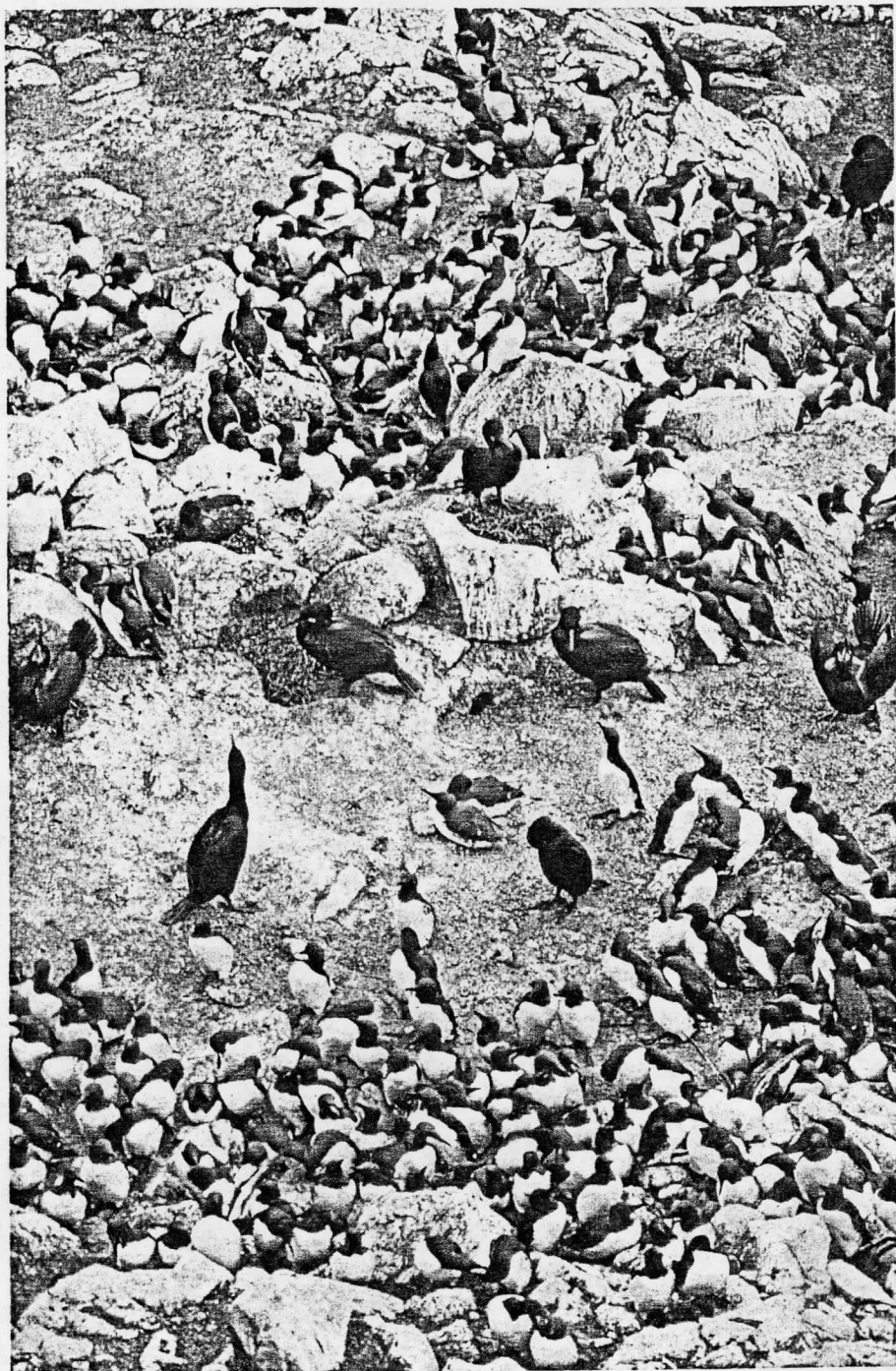
The breeding sea birds of the Farallones are representative of the nesting marine birds of the Pacific Coast of the United States. The twelve breeding species include the ashy and Leach's storm petrels, double-crested, Brandt's and pelagic cormorants, black oystercatcher, western gulls, common murre, pigeon guillemot, Cassin's and rhinoceros auklets and tufted puffin. The Farallones are the world population centers for the western gull and the ashy storm petrel; nearly ninety percent of the entire ashy storm petrel population nests on these islands. The approximately 100,000 Cassin's auklets, 25,000 western gulls, 25,000 common murres, and 20,000 Brandt's cormorants, along with lesser numbers of the other species provide a concentration of wildlife almost unequaled in these latitudes.

Man, on the other hand, is unwelcome. Nature offers no easy landfall. Even on calm days a small boat must ferry the occasional visitor the last few yards to shore. Sailing between cavorting, inquisitive California sea lions, the zodiac comes alongside the rocky outcrop where people and provisions are handed ashore.

Only the western gulls nest close to the few paths on the island. They rise up, squawking indignantly, as people walk by. They leave their nests, sometimes placed just inches from the path, crying apparently in complaint, for every step is an intrusion into some bird's living space, and every movement is greeted by protests. Beyond, in the more inaccessible parts of

*Opposite: Western gulls and Brandt's cormorant. [Ron LeValley]*

*Brandt's cormorants and common murres share breeding grounds on the cliffs of the Farallon Islands. During spring and early summer, 250,000 birds, which spend most of their lives at sea, congregate on a few acres of rock to breed. [Jeff Foott]*



the island, the cliff face is an almost solid mass of small dark shapes. Every square foot, on which it is possible to nest or gain a foothold, is used. Not an inch of the island is wasted.

Most of these birds spend nine months of each year utterly alone on a wide ocean, only occasionally gathering around a rich food source. Now, for three months or so they must crowd together, not just with thousands of their own kind, but with many thousands of other species as well. Their continual interactions offer a lesson in ecological segregation, that concept which describes how different animals, or plants, coexist and divide up the available resources so that each species has a niche to itself.

Marine birds, though typically strong fliers and graceful swimmers, when they come to land, as they must at egg-laying time, are awkward and clumsy, and not very adept at avoiding terrestrial predators such as rats, raccoons, and foxes. Optimal nesting locations such as cliff sides, islands and other similar habitats are generally inaccessible to terrestrial predators. These nesting requirements are common to most sea birds, yet suitable sites are relatively scarce, so many individuals of different species must inevitably congregate.

The one Farallon sea bird that is nimble on land is the opportunistic western gull. This agility, combined with its rather aggressive behavior and catholic appetite, make the gull an integral factor in the nesting habits of all the other Farallon birds. In addition to feeding on man's refuse at garbage dumps, from fishing boats and wharfside restaurants, the western gull does not hesitate to make a meal of another bird's eggs and chicks. Consequently the other sea birds have developed measures to protect their offspring. Either the adults are constantly vigilant at the nest, or they excavate burrows or use rocky crevices to hide their eggs and young.

The larger birds, such as the cormorants, are big enough to defend their nests and fledglings. In fact, while the cormorants are gathering nest-building material, the gulls themselves often become the victims. While sitting in a blind overlooking a gull colony last spring, I saw a raiding party of three species of cormorants literally ripping up all vegetation in their path, including pulling the nest out from underneath an incubating western gull! There was little the gull could do but scream and watch its eggs roll down the hill. Common murrelets, though much smaller than the cormorants, and even smaller than the western gull, nest in such dense colonies that they

are often "shoulder-to-shoulder". Their beaks present a formidable defense against a marauding gull.

The tufted puffin and pigeon guillemot lay their eggs in rocky crevices, out of reach of a gull's bill. This affords both parents the freedom to spend more time feeding than if one of the pair had to remain constantly at the nest. Furthermore, these birds, smaller still than the murrelets, might have difficulty discouraging a western gull from a potential meal.

The smallest of the Farallon sea birds, the Cassin's auklets and the ashys and Leach's storm petrels are faced with a greater survival problem in that even the adults may fall victim to the western gull's appetite. So these species only visit the island under cover of darkness and lay their eggs and raise their young in the safety of small burrows or crevices. The auklets and storm petrels arrive on the islands after night has fallen and usually leave again before the first light of morning. Only when incubating eggs do they stay on the islands during the day, and then in the security of their burrows. A common sight in the early morning during the nesting season is the ruckus caused by a dozen gulls squabbling over an auklet that has stayed too late and been captured. This is daily proof of the strong selection against auklets that linger too long in the gull-dominated daylight hours.

During my residency on the island I was always fascinated by the nighttime arrival of the Cassin's auklets. Their numbers alone are impressive. With more than 100,000 birds on approximately 100 acres, there are about three auklets per square foot! As the bird population almost doubles with the coming of darkness, the islands seem to take on a much more urgent character. The bird's nocturnal vocalizations are often loud enough to keep weary biologists awake.

Auklets, like many sea birds, are fast, straight fliers, but lack maneuverability. When the thousands of Cassin's auklets converge on South Farallon Island each evening, it is dangerous to be outside. Light seems to attract them, and a flashlight is an invitation for a collision. But if their numbers are impressive, their ability to find the island during the dark, foggy nights typical of central California summers, is even more amazing. The auklets and storm petrels may make daily flights over the ocean of more than a hundred miles in search of food. Yet they are capable of returning to their burrows seemingly without the aid of stars or landmarks, using an unknown navigation system that



should be the envy of human mariners.

The feeding strategies evolved for ecological segregation enable these different species to coexist. The opportunistic feeding habits of the western gull help it take advantage of both food sources that are not predictable or plentiful enough to support a feeding specialist, as well as of abundant food supplies that are temporarily available to a wide variety of species. Most sea birds, however, are specialists concentrating on particular feeding methods or on prey in particular habitats.

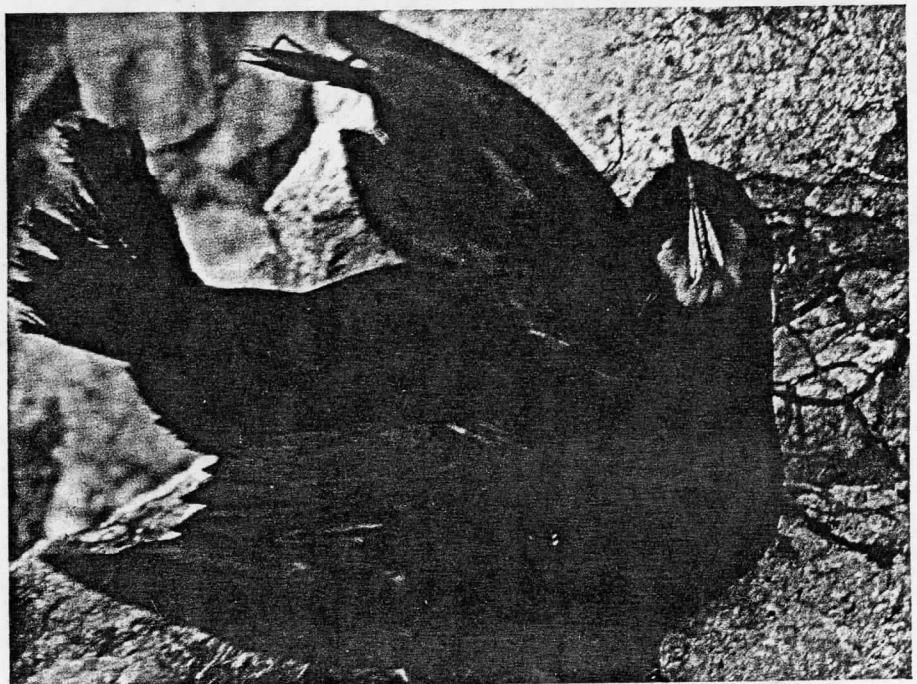
The black oystercatcher is more properly a shore bird, but it is included in many accounts of marine birds because it is often part of sea bird breeding communities in the North Pacific. It is an intertidal forager, feeding primarily on molluscs, crustaceans and worms. Only the oystercatcher is capable of opening mussel shells and removing limpets from the rocks.

The storm petrels are diminutive sea birds, about one-half the weight of a robin, yet they spend nearly all their lives at sea, not even coming to shore to avoid the fiercest storms. They feed by flying just above the ocean, sometimes pattering their feet on the water and dipping their bills into it to pick small fish and invertebrates from the surface. They feed over the deeper ocean waters beyond the continental shelf. Only rarely are they sighted in the shallows close to shore. The two species of storm petrels probably avoid competition for food by foraging at different distances from the island. The Leach's storm petrel has slightly more wing area per body weight than the ashy and usually arrives at the island about an hour later, presumably using the extra time in traveling to and from more remote feeding grounds.

The remaining Farallon sea birds have evolved along two different lines to catch food in the sea. The cormorants are foot-propelled divers capable of fishing at surprising depths, while the auks fly underwater penguin fashion, using their wings. The cormorants feed on fish, squid, octopus and crustaceans generally found on or near the bottom. Their dives may descend as deep as two hundred feet, and will often last over a minute.

This diving ability is aided by a peculiar characteristic of their oil gland which is located just above the tail of all birds, but is especially well developed in most water birds. Oil from this gland is applied to the feathers during preening and serves to waterproof them, thus making the bird more buoyant. In the cormorant the oil gland is not well developed, consequently its feathers are not as waterproof, and the

*Top: The Cassin's auklet is so small that even the adult can fall prey to the western gull. To avoid capture they leave the islands before dawn and return after sunset. This auklet stayed too late. [Stephen H. Morrell]. Below: Male Brandt's cormorant builds a nest, sits on it, throws his head back to show off the bright blue on the underside of his lower mandible, and flutters his wings to attract the female. [Stephen H. Morrell]*



bird is less buoyant. As a result the cormorant need not expend much energy overcoming the buoyancy characteristic of most of the other water birds. The price cormorants pay for this advantage is that they must regularly leave the water and dry their feathers to keep from becoming waterlogged. This is the primary reason that cormorants are commonly found roosting, in a characteristic wing-drying posture, on cliff sides, piers and buoys, while most other water birds float in rafts.

Even though all three Farallon cormorant species generally feed in deep water, there is a certain amount of selection apparent in their diet. The double-crested cormorants, of which the islands' population numbers only about seventy-five, is somewhat of a specialist, feeding mostly on fish found on or near the sandy bottom. The most common cormorant on the Farallones, the Brandt's cormorant, also feeds along sandy or muddy bottoms, but seems to concentrate on the schooling fish above the sea floor. The pelagic cormorant feeds largely on fish, octopus, crabs and other invertebrates found on or near rocky bottoms rather close to shore. They are known to dive in excess of 500 feet to gather seaweed for their nests. Presumably, they can also feed at similar depths.

The five species of auks nesting on the Farallones are an excellent example of how a single method can be exploited to obtain distinctly different sizes and distribution of resources. The smallest of the group, the Cassin's auklet, feeds mostly on planktonic crustaceans, mainly euphausiids and fish larvae. During the breeding season both sexes use a pouch under their tongue to transport food from the feeding grounds to the chicks waiting in the burrows.

The diet of the larger rhinoceros auklet, a rare Farallon breeder, is not well known, but limited observations suggest that in California they feed on medium-sized fish and crustaceans in rather deep water.

The tufted puffin is a medium-sized auk with a brightly colored bill that looks as if it would serve better for cracking walnuts than for capturing fish. It tends to feed on small or medium-sized fish found beyond the continental shelf, just below the surface. Its ability to carry several fish at a time may enable it to range farther from the island than similarly sized auks.

Another medium-sized auk breeding on the Farallones is the pigeon guillemot. As its name implies, it is about the same size as a domestic pigeon. The guillemot's diet consists of fish, octopus, crabs and other bottom-dwelling animals that it captures in waters less than a hundred feet deep very

near the island.

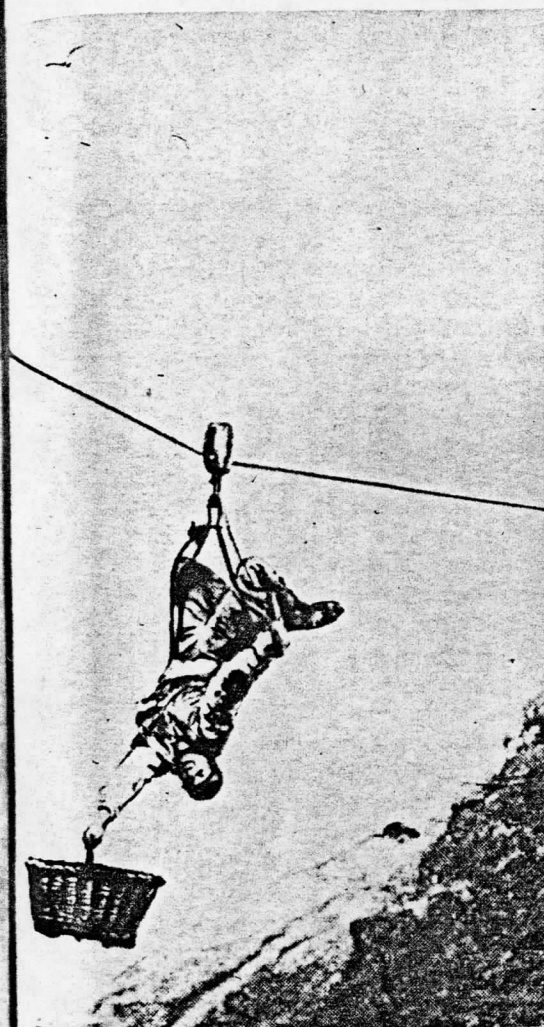
The largest of the Farallon auks is the common murre which feeds principally on fish, squid and crustaceans in the water column, mostly at a moderate depth, although they may sometimes feed in shallow water. Schooling fish such as larval rockfish and anchovies make up a large part of the food they feed their chicks. The young leave the island and go to sea while they are still only about half adult size, incapable of flight, they spend their first few weeks at sea swimming at their parents' side. At this time of the year the adults undergo a complete molt, and during the growth of the new outer wing feathers, they too are flightless. Very conveniently, the loss of the long outer wing feathers temporarily gives the murre a shorter, more rounded wing that is more efficient for underwater flying. At a time when the adult murre must feed a chick and also provide itself with enough energy to grow new feathers, it becomes an even more proficient underwater predator.

Although most of the sea birds are specialized in their feeding habits, there are certain prey organisms that occasionally become temporarily abundant, and fair game for all. In the waters around the Farallones the juveniles of rockfish and the shrimp-like euphausiids regularly provide a major portion of the food for the sea birds. When the euphausiids bloom, the paths on the islands are splattered with the red feces of the Cassin's auklets and western gulls, while the murre are likewise staining their colonies red. At times when the juvenile rockfish are abundant nearly all the larger birds will eat them. In some years the Brandt's and pelagic cormorants, common murre and pigeon guillemots may feed almost exclusively on these juvenile rockfish. Data gathered by the Point Reyes Bird Observatory suggest that the breeding success of these birds may be largely linked to the distribution and abundance of rockfish at critical periods.

It has become clear from studies around the Farallon Islands and elsewhere that food in the ocean is distributed in discrete patches, with large areas of relative "desert" in between. The annual variation in the distribution and abundance of these patches of food play a vital role in the lives of sea birds. As any Pacific coast salmon fisherman will tell you, the probability of finding fish varies unpredictably, not only from day to day, but from year to year. The same holds true for other fish, euphausiids and squid.

Probably because of the harshness of their environment and the difficulty in





Top: Egg gatherers who frequented the Farallon Islands during the latter half of the nineteenth century, wore heavy cotton flour sacks which could hold ten to twenty dozen eggs. Below: Egger, basket in hand, hangs suspended over the rocks as he collects eggs from steep cliffs. The eggers succeeded in decimating the bird populations, which have only recently recovered. [California Academy of Sciences]

sidered the islands as "open territory," and not lying within the province of the city to grant exclusive egg-gathering rights. Once, in 1853, a boat absent but three days brought in one thousand dozen eggs, and sold the whole cargo at a dollar a dozen. The prize was much too valuable not to be struggled for.

An egger had to estimate his weight and body movements carefully while on the rocks. With a slight shift in his load of fifty to two hundred eggs, he could be pitched from the slippery rocks over the side of a cliff. One egger fell off the cliffs with a shirt full of eggs and would have sunk under their weight had he not had the presence of mind to begin breaking them upon striking the water.

Others were not so fortunate. Accidents of this type took the lives of at least two eggers in 1870. Some were merely reported missing.

Even more threatening than the treacherous rocks, were the other eggers. Illegal poachers continued to pilfer eggs in large quantities. When the laying season began each spring, half a dozen groups of harvesters would swarm over the Farallones and when two rival parties met, severe fighting often resulted. One gang or the other was often driven out over the sharp rocks and into the ocean, from which rescue was not always certain.

Sometimes these battles lasted for several weeks and the city was denied its supply until things were settled. Such disputes were known as the "Egg Wars", and eventually involved even the federal government.

Parties of fishermen, Egg Company agents, lighthouse keepers, and government representatives argued for at least forty years over claims to the islands and rights to collect eggs.

Finally the Egg Company overstepped all bounds by demanding, in 1881, that the fog horn be silenced during the nesting season as it was scaring the birds away. A few scattered poachers were still present on the island, and when the cutter *Corwin* hove into sight one day, the eggers quickly rowed to Murre's Cave, and for two days hid inside the dank, guano-filled grotto, boat and all. The *Daily Alta California* once again reported, "Things at the Farallones have gone too far," and in May, twenty soldiers landed on the

island and ordered all egg collectors off government property.

At that same time, a consciousness toward conservation of the birds began to grow. Just as one man, Doc Robinson, had been largely responsible for beginning the egging operations, so was one man largely involved with ending it. He was Leverett M. Loomis. Loomis was a naturalist with the California Academy of Sciences, studying and making bird counts. Returning to the Farallones in 1896, five years after his first visit, he saw how greatly the population had been decimated by the egging activities. By that time, the colonies had been reduced so greatly, that less than eight thousand eggs were being taken from the islands. In his field notes of July 7, 1896, Loomis proposes a plan for saving the remaining birds: "It is apparent that unless this devastation is put to an end, the Farallon murre rookeries will ere long belong to the past. As I see it, a state law prohibiting the sale of eggs of wild birds and prompt action on the part of the lighthouse board is the only hope."

Returning to San Francisco, Loomis soon put his plan into motion. He approached William Dutcher, then chairman of the New York Bird Protection Committee of the American Ornithologists Union, and requested his cooperation in preventing the market trade and the egg collectors from exterminating the Farallon populations of murre, gulls, and petrels. Dutcher wrote to the secretary of the Lighthouse Board, pointing out that as a public servant, the present keeper exceeded his duties by engaging in the commercial pursuit of egg harvesting on the Farallones. His letter was referred to the Twelfth District in San Francisco, and after looking into the matter, the board declared "that the lighthouse keepers shall be prohibited from . . . collecting or selling wild birds' eggs on these islands, in any form."

In 1918, the Farallones became a federal bird reserve, and in 1972, protection of the breeding ground became complete—a move which had taken nearly seventy-five years to implement. Today, the Farallones are in a condition almost as wildly primitive as they were in the early nineteenth century, and the bird populations are thought to approach their original numbers.

keeping themselves alive, most sea birds lay only a few eggs each year; generally between one and three eggs (cormorants are unusual in that they lay five or more), while the same sized ducks, in a fresh-water habitat may lay from seven to twelve eggs. To compensate for their low reproductive rate they generally live a long time. Gulls are known to live over thirty years, and medium-sized to large auks may live as long as twenty years. Fresh-water ducks, on the other hand, rarely live longer than five years.

Like many other birds, sea birds typically return to the same nest site every year and mate for life. Older birds often arrive at the breeding colony earlier and are more successful in their reproductive efforts.

Data from the Farallones and other studies indicate that there are great variations in the annual reproductive success and biologists are just beginning to assess the effect of these short-term fluctuations on long-term population trends in sea birds. Changes in the oceanographic conditions of central California are thought to be one of the causes of these trends. For example, the populations of the tufted puffin and the double-crested cormorant have been very low since around the turn of the century when human activities on the Farallones initiated the decline.

Dr. David Ainley and coworker Jim Lewis have suggested that the continued low population is the result of the disappearance of an important food source, the Pacific sardine, which all but vanished from central California waters from the 1920s through the 1940s, probably because of overfishing during a prolonged period of colder than normal waters. The Cassin's auklet is now much more abundant on the islands than it was in the mid-1800s when a period of warmer than normal ocean waters decreased their food supplies. When the colder waters returned to the central California area in the 1870s, the number of auklets began to increase once more.

Another cause for the fluctuations have been the interactions between sea birds and man. The Farallon sea birds have felt man's influence during most of the past 400 years. The recorded history of the Farallones begins with Sir Francis Drake who, in 1579, includes the words "plentiful and great stores of seales and birds" in his account of the islands. When Drake replenished his stores with seals and birds from the islands he began an exploitation that was not to end until the 1890s.

At first man's attention was primarily focused on the fur and elephant seals, and

birds and their eggs were probably only incidentally harvested. But by the time of the 1849 gold rush, when the seals had been mostly exterminated, the commercial eggging began. Sea bird eggs commanded prices as high as a dollar a dozen during the 1850s. Most of the eggs sold were those of the gulls and the more sought after murre. Cormorant eggs were not as popular because the whites remained clear even after cooking and they did not look very appetizing.

The eggers would arrive on the island in the early part of the laying season and set about smashing all the eggs they could find, thus ensuring that eggs collected on subsequent days would be fresh. In the beginning of the season, gull eggs were gathered, but later, when the murre commenced laying, gull eggs were ignored. Because of the gulls' habit of preying on the eggs of murre, the eggers considered them competitors and would step on their eggs and chicks at every opportunity. Murre eggs were more desirable as their thicker shells made them less likely to break during the thirty-mile ocean voyage to shore.

While working, the eggers wore long cotton blouses made of flour sacks with a rope tied round their waist. A strong picker might carry eighteen to twenty dozen eggs. They also wore shoes with soles of braided rope for improved footing on the rocks made slippery by the summer fog. At the end of the day the eggs were washed and stored in a stone-walled shed to await transport to San Francisco. At first, approximately half a million eggs were harvested annually. When eggging ended in the 1890s an estimated fourteen million eggs from the Farallones had been sold in the markets of San Francisco.

During the almost fifty years of eggging the murre population dropped from an estimated 400,000 birds to approximately 20,000. Similar declines occurred among the gulls and the cormorants, primarily as a result of nearly constant disturbance throughout the breeding season. Western gull and Brandt's cormorant populations were reduced to one-fourth of their pre-eggging levels. Double-crested cormorants decreased from an estimated 5,000 birds to only twenty pairs. The rhinoceros auklet completely disappeared from the Farallones as a breeding bird.

The end of the eggging years did not stop the decline of sea bird populations on the Farallones. Since 1855 the United States government has maintained a lighthouse and other navigational aids on Southeast Farallon Island, first under the Lighthouse Service and later under the Coast Guard.



Until 1965 there were four resident families along with their dogs, cats, hogs, chickens and a mule. Thereafter the Coast Guard maintained a crew of four resident keepers until 1972, when the lighthouse was automated. In 1972 the Point Reyes Bird Observatory, through an agreement with the United States Fish and Wildlife Service, became the caretaker of the island.

The relatively large numbers of people and their domestic animals were certainly a disturbing influence on the sea birds. The mule was reported to have lived on eggs during the bird-breeding season. Cats and dogs undoubtedly wreaked havoc on the bird colonies. Also, sometime during the late 1800s Old World rabbits were introduced and, until their extermination in the early 1970s by PRBO personnel, they competed with the larger auks for nest burrows and adversely affected the island's flora.

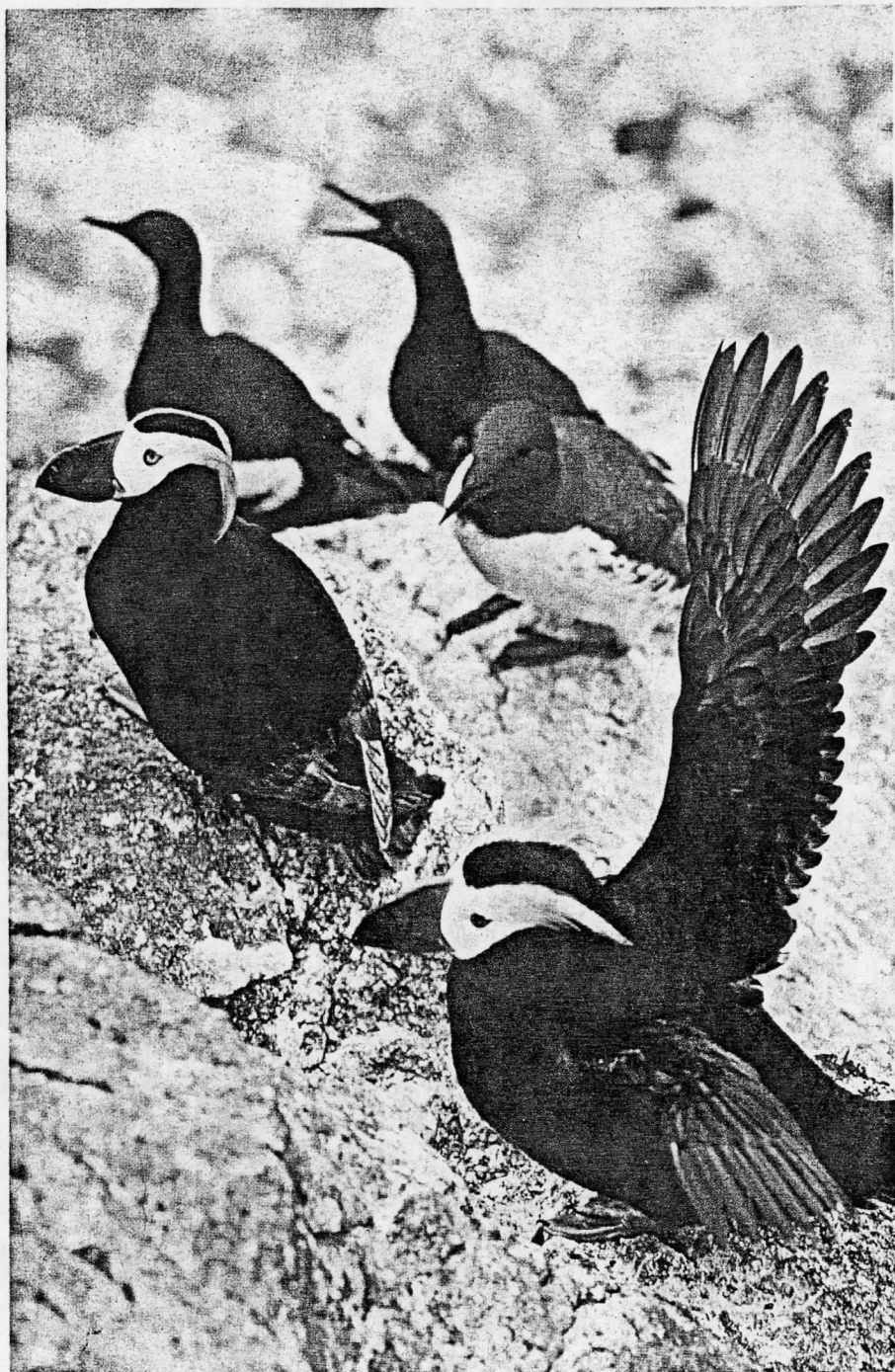
Another major threat to the health of sea bird populations appeared after the turn of the century—oil pollution. During the first half of this century it was common practice for sea-going motor vessels to pump out their bilges near the Farallones prior to entering San Francisco Bay. Accounts of the Farallon sea bird life during that period nearly always mention offshore oil slicks and oiled birds on the islands, and in 1937 a spill killed thousands of sea birds, especially murres.

Since the arrival of the Point Reyes Bird Observatory on the Farallones in 1968, the interactions between man and the sea birds have improved. Major portions of the Southeast Island are now closed to any human intrusion, including research. The domestic animals (except for the ubiquitous house mouse) have been removed, and arrangements have been made with the military helicopters, that occasionally service the Coast Guard installations, for them to cause a minimum of disturbance to the island's wildlife.

Happily the sea birds are responding. The gull, murre, and Brandt's cormorant populations are all increasing rapidly. Rhinoceros auklets have returned to breed and they, as well as the tufted puffin, seem to be growing in numbers. Continued study and monitoring of the Farallon sea birds and those of the surrounding waters will help ensure the continued presence of these creatures as an integral part of the marine environment.

*Ron LeValley is a biologist for the Point Reyes Bird Observatory on Southeast Farallon Island. His special interest is in the distribution and evolution of sea birds and whales.*

*Tufted puffins, common murres and a pigeon guillemot share a ledge on the crowded Farallon cliffs.*



*[Jeff Foott]*





# Oceans

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**Cover:** Rhinoceros auklet, its mouth full of sardines. It is believed that it holds them with its tongue while catching more. [Wayne Ellerbee]

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